SPECIFICATION

Please amend the specification as follows:

On page 1, delete lines 1-4 of the specification.

Amend paragraph beginning at page 1, line 5 as follows:

~~Description~~Background of the Invention

Amend paragraph beginning at page 1, line 6 as follows:

The invention relates to a wireless radiofrequency data communication system comprising: a base-station comprising ~~a multiple of~~ N first groups and a signal processing-unit comprising memory means and processing means, wherein each first group comprises a receiver-unit provided with a receiver and at least one antenna which is connected to the receiver-unit, wherein the signal processing-unit is connected with each of the first groups for processing receive-signals generated by each of the first groups, and ~~a multiple of~~ M second groups for transmitting radiofrequency signals to the first groups, wherein each second group comprises a transmitter-unit provided with a transmitter and at least one antenna which is connected to the transmitter-unit, wherein the memory means of the signal processing-unit are provided with information about the transfer-functions of radiofrequency signals from each of the antennas of the second groups to each of the antennas of the first groups, and wherein the transmitters and receivers operate on essentially the same radiofrequency or radiofrequency-band.

Amend paragraph beginning at page 1, line 20 as follows:

Wireless radiofrequency data communication systems of this type are known and find their applications in a variety of fields. An example of such an application can be found in the domain of digital communication for electronic-mail. In this ~~application~~ application, each personal computer can be provided with at least one second set so that

the personal computer can be incorporated in an network. The base-station may in that case be connected with a server of the network. Further examples are given, for instance, in the domain of mobile telephony. In the case of mobile ~~telephony~~ telephony, the base-station is a telephony exchange. In the majority of the ~~applications~~ applications, more than one second set wants to communicate with the base-station. This means that the second group transmits signals to this base-station and also receives signals from this base-station. Since it would not be acceptable if all second groups would have to wait for each other's communication to be finished, there is a need for simultaneous communication. Simultaneous communication allows more second groups to communicate at the same time with the base-station. A straightforward and common way of realising simultaneous communication is to assign different radiofrequencies to the respective second groups. In this ~~way~~ way, all data signals can be separated easily by the first groups in the base-station by ~~frequency selective~~ frequency-selective filters. Furthermore, the base-station can communicate with each second group at the specific radiofrequency ~~which~~ that has been assigned to the second group. A transmitted radiofrequency signal contains the actual information to be transmitted to the receiver. This actual information has been modulated on the radiofrequency carrier-signal. Several techniques have been developed for modulating information on the carrier-signal like frequency-modulation, phase-modulation, amplitude-modulation, et cetera.

Amend paragraph beginning at page 2, line 13 as follows:

A radiofrequency signal ~~which~~ that is transmitted by a second group travels from the antenna of the second group along so-called travel-paths to the antennas of the first groups. During the travelling, depending of the specific travel-path, the radiofrequency signal is attenuated and also a phase-distortion is incurred on the radiofrequency signal. The phase-distortion of the radiofrequency signal can be corrected by the signal processing-unit in the base-station on the basis of the information about the transfer-functions. This can be of special interest if information is modulated on the radio-frequency signal according to a phase-modulation technique.

On page 2, after line 20, insert the following heading:

SUMMARY OF THE INVENTION

Amend paragraph beginning at page 2, line 21 as follows:

In an embodiment~~It is an object~~ of the invention, ~~invention to provide in~~ a detection system ~~which~~ increases the communication capacity of the wireless communication system per frequency or frequency-band used by the system. The embodiment ~~In particular it is an object of the invention to increase~~ increases the data communication capacity from the second groups to the first groups by creating multiple separate simultaneous data communication channels. ~~More in particular~~ This embodiment provides ~~it is an object of the invention to provide in~~ a detection system comprising M simultaneous separated communication signals for which the ~~multiple~~ number N of first groups ~~N~~ may be less than, equal to, or greater than the ~~multiple~~ number M of second groups.

Amend paragraph beginning at page 3, line 1 as follows:

The present invention ~~therefore~~ provides ~~in~~ a wireless radiofrequency data communication system which is characterised in that the signal processing-unit is arranged to process, in use, the receive-signals on the basis of ~~the~~ a Maximum Likelihood Detection method, such that, for each second group of the second ~~groups~~ groups, an individual communication channel is formed with the ~~base-station~~ base-station, wherein these communication channels are generated simultaneously and separately from each other.

Amend paragraph beginning at page 3, line 7 as follows:

In this ~~manner~~ manner, multiple communication channels are realised on the same frequency, or within the same frequency-band, based on the principle that the signals can be separated thanks to the different characteristics of the transfer-functions.

Due to the Maximum Likelihood detection ~~technique~~ technique, this holds for the cases wherein the number N of first groups is greater than, equal to, or less than the number M of second groups. ~~Hence~~ Hence, the data communication capacity per frequency or frequency-band is indeed increased. The geometry of the configuration of the communication system determines the transfer functions ~~which~~ that belong to the different travel-paths between the antennas of the first groups and the second groups in the base-station. These transfer functions are expressed by complex numbers. Each complex number expresses the transfer function between one antenna of one of the first groups and one antenna of the second group. The amplitude of the complex number is the attenuation of the signal's strength and the phase of the complex number is the phase modulation incurred during transmission along the travel-path. Since the used frequencies are relatively high, the transfer functions depend largely on the configuration.

Amend paragraph beginning at page 4, line 1 as follows:

In a favourable embodiment of the ~~invention~~ invention, the wireless communication system is characterised in that the signal processing-unit is arranged to calculate, in use, a detection signal $\mathbf{x}_{DET}$ according to

$$\mathbf{x}_{DET} = arg_{over\ set}\ min(\|\mathbf{r} - \mathbf{H}\ \mathbf{x}^{p}_{SET}\|), \qquad \textbf{(I)}$$

where $arg_{over\ set}\ min(\|...\|)$ is a function which, according to **(I)**, yields that vector $\mathbf{x}_{DET}$ out of a set $\mathbf{X}_{SET}$ of P vectors $\mathbf{x}^{p}_{SET}$ (p=1,..,P) for which the length $\|\mathbf{r} - \mathbf{H}\ \mathbf{x}^{p}_{SET}\|$ of the complex N-dimensional vector $\mathbf{r} - \mathbf{H}\ \mathbf{x}^{p}_{SET}$ is minimal, wherein $\mathbf{r}$ is a complex N-dimensional vector $[r_1,...,r_i,...,r_N]^T$ with r_i being the signal received by the i^{th} first group of the N first groups, $\mathbf{H}$ is a complex [N×M] ~~[N * M]~~ matrix containing transfer-functions h_{im} (i=1,...,N; m=1,...,M), wherein h_{im} is the transfer-function for transmission from the m^{th} second group of the M second groups to the i^{th} first group of the N first groups, and where $\mathbf{x}^{p}_{SET}$ is the p^{th} complex M-dimensional vector $[x^{p}_{SET,1},...,x^{p}_{SET,m},...,x^{p}_{SET,M}]^T$ of the set $\mathbf{X}_{SET}$, wherein the vectors x^{p}_{SET} in the set $\mathbf{X}_{SET}$ contain possible combinations of values which can be assigned by the second groups to an information signal $\mathbf{x}$, where $\mathbf{x}$ is a M-dimensional vector $[x_1,...,x_m,...,x_M]^T$ with x_m being the information signal transmitted

by the m^{th} second group of the M second groups to the first groups and where x_m is one individual communication signal. Equation **(I)** is based on the model

Amend paragraph beginning at page 6, line 23 as follows:

An alternative embodiment according to the invention is characterised in that the signal processing-unit is arranged to find, in use, the detection signal $\mathbf{x}_{DET}$ according to a Reduced Search Technique wherein a search-tree is passed through according to the following steps 1 to 7:

- **Step 1**: calculate the values of the lengths of the C vectors **v** according to the C possible values $x^P_{SET,1}$

$$\mathbf{v} = (\mathbf{r} - \mathbf{h}_1 * x^P_{SET,1}), \qquad \textbf{(VII)}$$

wherein h_1 is the first column of **H;**

- **Step 2**: select those combinations of values for $x^P_{SET,1}$ for which the lengths of **v** are smaller than T, as well as the corresponding vectors **v** and set m=2;
- **Step 3**: calculate the lengths of the new vectors **v** given by $\mathbf{v} = \mathbf{v}_{old} - \mathbf{h}_m * x^P_{SET,m}$, **(VIII)**

wherein $\mathbf{v}_{old}$ is one of the vectors **v** resulting from the preceding step and where $\mathbf{h}_m$ is the m^{th} column of **H**, and adjust the ~~treshold~~ threshold T;

- **Step 4**: select those combinations of values for $[x^P_{SET,1},\ldots, x^P_{SET,m}]$ for which **v** is smaller than T, discard the other combinations and set $m = m_{old} + 1$, where m_{old} is m from the preceding step;
- **Step 5**: if m<M then go to Step 3, else go to step 6,
- **Step 6**: calculate the lengths of the new vectors **v** given by $\mathbf{v} = \mathbf{v}_{old} - \mathbf{h}_M * x^P_{SET,M}$, **(IX)**
- **Step 7:** the detection signal $\mathbf{x}_{DET}$ is determined as that combination of values $\mathbf{x}_{DET} = [x^P_{SET,1},\ldots, x^P_{SET,M}]$ which corresponds to the vector **v** with the smallest length, wherein T is a predetermined fixed threshold value which controls the size P of the set $\mathbf{X}_{SET}$ and wherein the constellation size C of the system is the number of values $x^P_{SET,m}$ which can be assigned by one of the second groups to one component x_m (m=1,..,M) of ~~x, and~~ **x**, and wherein $\mathbf{v}_{old}$ is one of the vectors **v** resulting from step 3, the calculated

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detection signal $\mathbf{x}_{DET}$ is the combination of values $\mathbf{x}^{p}_{SET}$ corresponding to the smallest vector **v**. In this embodiment the number of requisite calculations for obtaining the detection signal $\mathbf{x}_{DET}$ is not known ~~on~~ beforehand since the number of vectors **v** which are selected in the respective steps 2 and 4 may vary from ~~step tot step~~ step-to-step, depending on the adjusted value for the threshold T and the noise **n** in the signal **r**.

Amend paragraph beginning at page 8, line 21 as follows:

- **Step A4:** determine the detection signal $\mathbf{X}_{DET}$ according to equation ~~(A)~~(I), wherein the test set is defined with the C^{M-1} vectors x^{p}_{SET} from the preceding step.

On page 9, after line 1, insert the following heading:

BRIEF DESCRIPTION OF THE DRAWINGS

On page 9, after line 15, insert the following heading:

DETAILED DESCRIPTION

Amend paragraph beginning at page 10, line 27 as follows:

Each first group 6.i, i=1,...,N receives a radiofrequency signal r^{RF}_{i} in the antenna ~~12.i, this~~ 12.1. This signal r^{RF}_{i} is a result of the interference of all transmitted signals x^{RF}_{m}, m=1,...,M. The signal r^{RF}_{i} is demodulated by the receiver-unit 10.i to a low-frequency receive-signal r_i which contains the modulated information of data-signal x_m. The N receive-signals r_i, i=1,...,N are fed to the input of the signal processing-unit 4. The signal processing unit 4 calculates M output signals $x_{i,DET}$, i=1,...,M. Each output signal $x_{i,DET}$ is an estimation for the data-signal x_i. The detection signal $x_{i,DET}$ is ~~imputed~~ inputted to the coding/decoding-unit ~~14.i, i=1,...,N~~ 14.i, i=1,...,M, which unit generates the QAM-symbol $c_{i,DET}$. This QAM-symbol is an estimation for the QAM-symbol c_i.

Amend paragraph beginning at page 11, line 7 as follows:

The operation of the signal processing unit 4 will now be elucidated on the basis of a mathematical framework. The relation between the data-signals x_m, m=1,...,M and the receive-signals r_i, i=1,...,N is given with the following vector equation:

$$\mathbf{r} = \mathbf{H}\,\mathbf{x} + \mathbf{n}, \qquad \textbf{(XIII)}$$

where **r** is a N-dimensional complex vector $[r_1,...,r_i,...,r_N]^T$, where H is a complex ~~[N*M]~~ [N×M]-matrix containing the transfer-functions h_{im}, (i=1,...,N; m=1,...,M) and wherein **x** is a M-dimensional complex vector $[x_1,...,x_m,...,x_M]^T$. The noise vector **n** is a ~~N-dimensional~~ N-dimensional complex vector $[n_1,...,n_i,...,n_N]^T$, with n_i being the noise term picked up during reception of the signal $r^{RF}{}_i$. The signal processing unit 4 calculates detection signals $\mathbf{x}_{DET}= [x_{1,DET},...,x_{M,DET}]^T$ which are estimations for the data-signals **x**. These calculations are performed according to ~~the~~ a Maximum Likelihood method. It has to be noted here that the detection signals are sometimes called Maximum Likelihood signals. One important aspect of the Maximum Likelihood approach is that use is made of the knowledge that the QAM-symbol c_m, m=1,...,M can only take on a limited number of values. This number is called the constellation size C of the second group. So, the data-signal x_m for a particular m can only take on C different values. This ~~implicates~~ implies that the total number of possible different value combinations of the data-vector **x** is C^M. All these C^M different value combinations together constitute the test set $\mathbf{X}_{SET}$, wherein the p^{th} element of the set is a value combination which is a complex M-dimensional vector $\mathbf{x}^p{}_{SET}$. This ~~implicates~~ implies that the signal processing unit can calculate a detection signal by trying to match all elements of the set and choosing the best fit according to **(XIII)**. In order to save processing ~~time~~ time, it is also possible ~~only~~ to match only the elements of a subset of the set. For the latter ~~approach~~ approach, several reduced search techniques are developed according to different embodiments of the invention. The detection signals ~~which~~ that are found by matching elements of the set are called Maximum Likelihood signals.

Amend paragraph beginning at page 12, line 3 as follows:

The signal processing-unit 4 can find the Maximum Likelihood detection signal in particular according to the following algorithm. This algorithm will be described in mathematical terms. The detection signals $\mathbf{x}_{DET}$ are calculated by the signal-processing-unit 4 according to

$$\mathbf{x}_{DET} = arg_{over\ set}\ min(\|\mathbf{r} - \mathbf{H}\ \mathbf{x}^{p}_{SET}\|), \qquad \textbf{(XIV)}$$

where $arg_{over\ set}\ min(\|...\|)$ is a function which, according to **(XIV)**, yields that vector $\mathbf{x}_{DET}$ out of a set $\mathbf{X}_{SET}$ of P vectors $\mathbf{x}^{p}_{SET}$ (p=1,..,P) for which the length $\|\mathbf{r} - \mathbf{H}\ \mathbf{x}^{p}_{SET}\|$ of the complex N-dimensional vector $\mathbf{r} - \mathbf{H}\ \mathbf{x}^{p}_{SET}$ is minimal and where $\mathbf{x}^{p}_{SET}$ is the pth complex M-dimensional vector $[x^{p}_{SET,1},...,x^{p}_{SET,m},...,x^{p}_{SET,M}]^{T}$ of the set $\mathbf{X}_{SET}$, wherein the vectors x^{p}_{SET} in the set $\mathbf{X}_{SET}$ contain possible combinations of values which can be assigned by the second groups to an information signal **x**, where x_m is one individual communication signal. Since the data-signals ~~x_m m=1,...,M~~ x_m, m=1,...,M, are transmitted simultaneously, each detection signal $x_{m,DET}$ results in the generation of one of M simultaneous data communication signals.

Amend paragraph beginning at page 12, line 16 as follows:

The principle of ~~the~~ a Maximum Likelihood Detection method will now be illustrated with the schematic of figure 2. This figure shows QAM-symbols c_m, m=1,...,M, ~~sybols c_m m=1,...,M~~ which are the possible inputs to the coding/decoding units 22.m. The QAM-symbol c_1 is marked with a * 26.1 and equals (-1+j). Each diagram 24.m contains a QAM-symbol c_m which can take on 4 different values. These possible values are marked with **0** 28.m. The actual possible values for the QAM-symbols are (1+j), (-1+j), ~~(-1-j)~~ (1-j), and (-1-j). Thus here the constellation size C of the second groups is C=4. As ~~is~~ explained ~~before~~ previously, the QAM-symbols are the information ~~which~~ that is modulated on the corresponding data signal x_m. However, from a mathematical point of ~~view~~ view, the QAM-symbols are identical to the signals x_m. So, the value of the low-frequency signal x_1 in the example of figure 2 is (-1+j) and the value of x_M is (1-j). The transmission and the subsequent reception of the QAM-symbols to the first groups 6.i

takes place via radiofrequency carrier signals. The mathematical formulation of this transmission is a transformation of the vector **x** with the matrix **H** and an addition of noise **n**, see equation **(XIII)**. This is illustrated with the transformation block 30 which contains M input-signals ~~x_m $m=1,\ldots,M$~~ x_m, $m=1,\ldots,M$, and N ~~output-signals r_i~~ output-signals r_i, $i=1,\ldots,N$. The values of the output signals ~~r_i $i=1,\ldots,N$~~ r_i, $i=1,\ldots,N$ are represented with * marks 34.i in the diagrams 32.i. Each diagram 32.i contains one received component r_i of **r**. As a consequence of the time-varying nature of H and as a consequence of noise the values of r_i will generally vary, even if the QAM-symbols c_m would have continuously constant values. Now the signal processing unit 4 calculates the transformation of all possible ~~number of~~ value combinations in the test set (or a subset of the test set) of the QAM-symbols, in order to try these elements in **(XIV)**, according to:

$$\mathbf{r}^{p}_{SP} = \mathbf{H}\,\mathbf{x}^{p}_{SET}, p=1,\ldots,P. \qquad \textbf{(XV)}$$

The complete test set comprises $P=C^M$ combinations (~~but for a subset of the test set~~ but, for a subset of the test set, $P<=C^M$). Equation **(XV)** yields possible receive-signals in the situation of absence of noise. These signals are indicated with **0** marks 36.i in the diagrams 32.i. Finally, the Maximum Likelihood solution is that value combination $\mathbf{x}^{p}_{SET}$ in the test set, which corresponds to the 0 marks of its components, for which the value

$$||\mathbf{r} - \mathbf{r}^{p}_{SP}||, \qquad \textbf{(XVI)}$$

is minimal. In the case in which the vectors **r** and $\mathbf{r}^{p}_{SP}$ ~~only~~ comprise only one component, the Maximum Likelihood solution is found with the **0** in diagram 32.1 which is closest to the *.

Amend paragraph beginning at page 13, line 17 as follows:

Figure 3 gives a more detailed example of a wireless data communication system according to the ~~invention~~ invention, where the number of first groups N=3, the number of second groups ~~M=2~~ M=2, and the constellation size C=2. In ~~total~~ total, there are 4 possible value combinations which can be assigned to the data-signals **x**. In this ~~example~~ example, the data-signal [26.1, 26.2] is $\mathbf{x}= [(0+j), (0+j)]^T$. Since the number of first groups is greater than the number of second ~~groups~~ groups, a robust communication system, fairly insensitive to noise, is realised. The possible values for the components of

the data-signals **x** are schematically indicated with **0** marks ~~26.1~~ 28.1 in the diagrams 24.1 and 24.2 in figure 3. The test set comprises all these possible value combinations (P=4), so the test set $\mathbf{X}_{SET}$ is given with:

$$\mathbf{X}_{SET} = \{\mathbf{x}^1_{SET}; \mathbf{x}^2_{SET}; \mathbf{x}^3_{SET}; \mathbf{x}^4_{SET}\},$$

where:

$$\begin{aligned} \mathbf{x}^1_{SET} &= [(0+j), (0+j)]^T, \\ \mathbf{x}^2_{SET} &= [(0-j), (0+j)]^T, \qquad \textbf{(XVII)} \\ \mathbf{x}^3_{SET} &= [(0+j), (0-j)]^T, \\ \mathbf{x}^4_{SET} &= [(0-j), (0-j)]^T, \end{aligned}$$

wherein the notation $\mathbf{X}_{SET} = \{..;..\}$ means that $\mathbf{X}_{SET}$ is the set of all vectors which are enumerated between the brackets {.}. In this ~~case~~ case, the matrix **H** containing the transfer-functions is a complex ~~[3*2]~~ [3×2]-matrix. The transformation of the elements of the test set $\mathbf{X}_{SET}$ (see **(XVII)**) according to **(XV)** results in 4 vectors $\mathbf{r}^p_{SP}$, each of which has 3 components. The values of the respective components of the vectors $\mathbf{r}^p_{SP}$ are depicted in the respective diagrams 32.1, ~~32.2~~ 32.2, and 32.2 of figure 3 and marked with **0** marks 36.i, i=1,2,3. The transformation of the data-signal **x** according to **(XIII)** yields the receive signal **r**. The respective components of this signal are indicated with * marks 34.i in the respective diagrams 32.1, ~~32.2~~ 32.2, and 32.2 of figure 3. Note ~~that~~ that, despite the relation ~~$\mathbf{x} = \mathbf{x}^1_{SET}$~~ $\mathbf{x} = \mathbf{x}^1_{SET}$, the signal **r** is unequal to $\mathbf{r}^1_{SP}$ as a consequence of the noise **n**. The Maximum Likelihood solution is found according to **(XIV)**. Note that 2 simultaneous data communication channels are generated, which channels are the components of the vector **x** (the first channel is x_1 and the second channel is x_2).

Amend paragraph beginning at page 14, line 16 as follows:

Figure 4 gives an example of a wireless data communication system in which there are more second groups (M=2) than first groups (N=1). However, with ~~the~~ a detection algorithm according to the ~~invention~~ invention, the signal processing-unit sometimes can recover the transmitted M-dimensional data-signal **x**. In this ~~case~~ case, the data-signal [26.1, 26.2] is $\mathbf{x} = [(0+j), (0+j)]^T$. The constellation size C=2. So, there are 4 possible value combinations which can be assigned to the data-signals **x**. The possible

values for the components of these data-signals are indicated with **0** marks ~~26.1~~28.1 in the diagrams 24.1 and 24.2 of figure 4. The test set comprises all these possible value combinations (P=4), so the test set $\mathbf{X}_{SET}$ is given with **(XVII)**. In this ~~example~~ example, the matrix **H** containing the transfer-functions is a complex ~~[1*2]~~ [1×2]-matrix:

$$\mathbf{H} = [h_{11} \quad h_{12}] = [\mathbf{h}_1 \quad \mathbf{h}_2], \qquad \textbf{(XVIII)}$$

where the column $\mathbf{h}_1$ is identical to the scalar h_{11} and the column $\mathbf{h}_2$ is identical to the scalar h_{12}. The transformation of the elements of the test set $\mathbf{X}_{SET}$ (see **(XVII)**) according to **(XV)** results in 4 scalars r^p_{SP}. The values of these 4 scalars r^p_{SP} are depicted in the ~~diagrams~~ diagram 32.1 of figure 4 and marked with **0** marks 36.1. The transformation of the data-signal **x** according to **(XIII)** yields the receive signal r. In this ~~example~~ example, this signal is also a scalar which is indicated with a * mark 34.1 in the ~~diagrams~~ diagram 32.1 of figure 4. Note ~~that~~ that, despite the relation ~~$\mathbf{x} = \mathbf{x}^1_{SET}$~~ $\mathbf{x} = \mathbf{x}^1_{SET}$, the signal r is unequal to r^1_{SP} as a consequence of the noise **n**. The Maximum Likelihood solution is found according to **(XIV)** and is given with the **0** mark which is closest to the * mark 34.1.

Amend paragraph beginning at page 15, line 18 as follows:

The signal processing-unit 4 finds the Maximum Likelihood detection signal according to **(XIV)**. With this ~~equation~~ equation, the detection signal is found by trying to fit elements of the test set $\mathbf{X}_{SET}$. Since the test set comprises C^M ~~elements~~ elements, this can easily lead to a huge amount of processing time. To reduce the processing time, an embodiment of the invention provides ~~in~~ an algorithm ~~which~~ that can limit the search to a subset of $\mathbf{X}_{SET}$. A first ~~algorithm~~ algorithm, which provides ~~in~~ an intelligent way of choosing a pre-determined subset of ~~$\mathbf{X}_{SET}$~~ $\mathbf{X}_{SET}$, is given below and is called a Reduced Search Technique. In this Reduced Search ~~technique~~ technique, a search-tree is passed through according to the following steps 1 to 7:

- **Step 1**: calculate the lengths of the complex vectors **v** corresponding to all combinations of possible values which can be assigned to $[x_1,..,x_L]$. The vector **v** is given with

$$\mathbf{v} = (\mathbf{r} - \textstyle\sum_{i=1,..,L} \mathbf{h}_i * x^p_{SET,\,i}), \qquad \textbf{(XX)}$$

where $\sum_{i=1,..,L}$ (...) is a summation over the index i from 1 to L over the complex argument $[\mathbf{h}_i * x^p_{SET, i}]$ and where h_i is the i^{th} column $[h_{1,i},...,h_{N,i}]^T$ of the matrix **H**;

- **Step 2**: Select the K combinations of values for $[x^p_{SET, 1},.., x^p_{SET, L}]$ corresponding to the K smallest lengths of **v** as well as the K vectors **v** itself and set m = L+1;
- **Step 3**: Calculate the lengths of the C*K new vectors **v** given by

$$\mathbf{v} = \mathbf{v}_{old} - \mathbf{h}_m * x^p_{SET, m}, \qquad \textbf{(XXI)}$$

where $\mathbf{v}_{old}$ is one of the K vectors **v** resulting from the preceding step and where h_m is the m^{th} column of **H**;

- **Step 4**: Select those K combinations of values for $[x^p_{SET, 1},.., x^p_{SET, m}]$ that correspond to the K smallest lengths of **v** as well as the K vectors **v** itself and set m = m_{old} + 1, where m_{old} is m from the preceding step;
- **Step 5**: If m<M then go to Step 3, else go to step 6;
- **Step 6**: Calculate the lengths of the C*K new vectors **v** given by

$$\mathbf{v} = \mathbf{v}_{old} - \mathbf{h}_M * x^p_{SET, M}, \qquad \textbf{(XXII)}$$

- **Step 7:** the detection signal $\mathbf{x}_{DET}$ is determined as that combination of values $\mathbf{x}_{DET}$ = $[x^p_{SET, 1},.., x^p_{SET, M}]$ which corresponds to the vector **v** with the smallest length,

wherein K and L are predetermined fixed integer parameters which control the size P of the set $\mathbf{X}_{SET}$ and where $\mathbf{v}_{old}$ is one of the K vectors **v** resulting from Step 3, the calculated detection signal $\mathbf{x}_{DET}$ is that element of the set $\mathbf{X}_{SET}$ for which the vector **v** is smallest.

The principle of this reduced search technique is schematically illustrated in diagram 38 of figure 5 (according to the example of figure 4). In this ~~example~~ example, the pre-determined parameter L=1 and K=4. Furthermore, the constellation size C=2, the number of second groups M=2, the number of first groups N=1, the matrix **H** is given with ~~**(XVIII)**~~ **(XVIII)**, and the test set is defined with **(XVII)**. The received vector **r** is a scalar r. The first stage 40 of the algorithm is to evaluate **(XX)**. This results in principle in four lengths v1, v2, ~~v3~~ v3, and v4 corresponding to four vectors **v** (note that in this example **v** and $\mathbf{h}_1$ and $\mathbf{h}_2$ are all scalars):

$$v1 = ||r - h_1 * x^1_{SET, 1}|| = ||r - h_1 * j \ \ ||$$

$$v2 = ||r - h_1 * x^2_{SET, 1}|| = ||r - h_1 * (-j)||$$

$$v3 = \|r - h_1 * x^3_{SET,1}\| = \|r - h_1 * j\| = v1 \quad \textbf{(XXIII)}$$
$$v4 = \|r - h_1 * x^4_{SET,1}\| = \|r - h_1 * (-j)\| = v2.$$

These values v1 and v2 are shown in figure 5 in Step 1 of the algorithm 42. According to Step 2 both values v1 and v2 are selected. Hereafter, ~~in Step 3 and Step 4~~ in Step 3, and in Step 4, the lengths of 4 new vectors **v** are calculated. These 4 new lengths are:

$$v1 = \|r - h_1 * j - h_2 * j\|$$
$$v2 = \|r - h_1 * (-j) - h_2 * j\|$$
$$v3 = \|r - h_1 * j - h_2 * (-j)\| \quad \textbf{(XXIV)}$$
$$v4 = \|r - h_1 * (-j) - h_2 * (-j)\|.$$

Amend paragraph beginning at page 17, line 12 as follows:

_________These four lengths 44 are depicted in figure 5. From Step 5 of the ~~algorithm~~ algorithm, a jump is made to Step 6. Finally, in Step 6 the calculation of the Maximum Likelihood detection signal is finished. In this ~~case~~ case, the detection signal equals the test vector $\mathbf{x}^4_{SET}$: $\mathbf{x}_{DET} = \mathbf{x}^4_{SET}$. In the algorithm stated ~~above~~ above, the processing load of the signal processing-unit 4 is known ~~on~~ beforehand and can be controlled with the parameters K and L. It is important to note that the detection signal comprises two components whereas the receive-signal r ~~only~~ comprises only one component. So, in principle two separate simultaneous communication channels are formed. This example shows an important aspect of the nature of the detection algorithm according to certain embodiments of the invention, namely that the number of receivers may be less than the number of transmitters, and thus the number of receivers may also be less than the number of simultaneous communication channels.

Amend paragraph beginning at page 17, line 23 as follows:

In another embodiment of the wireless data communication ~~system~~ system, the signal processing-unit 4 also finds the Maximum Likelihood detection signal according to **(XIV)**. However, in this ~~embodiment~~ embodiment, the processing load of the signal processing-unit 4 is not known ~~on~~ beforehand. The subset of the test set ~~is~~ X_{SET}

is controlled with a real value threshold parameter T. The algorithm of this Reduced Search Technique is given below and comprises seven steps:

- **Step 1**: Calculate the values of the lengths of the C vectors **v** according to the C possible values $x^p_{SET,1}$

$$\mathbf{v} = (\mathbf{r} - \mathbf{h}_1 * x^p_{SET,1}). \qquad \textbf{(XXV)}$$

- **Step 2**: Select those combinations of values for $x^p_{SET,1}$ for which the lengths of **v** are smaller than T, as well as the corresponding vectors **v** and set m=2;
- **Step 3**: Calculate the lengths of the new vectors **v** given by

$$\mathbf{v} = \mathbf{v}_{old} - \mathbf{h}_m * x^p_{SET,m}, \qquad \textbf{(XXVI)}$$

  wherein $\mathbf{v}_{old}$ is one of the vectors **v** resulting from the preceding ~~step~~ step, and adjust the ~~treshold~~ threshold T;
- **Step 4**: Select those combinations of values for $[x^p_{SET,1},\ldots, x^p_{SET,m}]$ for which **v** is smaller than T, discard the other combinations and set $m = m_{old} + 1$, where m_{old} is m from the preceding step;
- **Step 5**: If m<M then go to Step 3, else go to step 6,
- **Step 6**: Calculate the lengths of the new vectors **v** given by

$$\mathbf{v} = \mathbf{v}_{old} - \mathbf{h}_M * x^p_{SET,M}, \qquad \textbf{(XXVII)}$$

- **Step 7:** the detection signal $\mathbf{x}_{DET}$ is determined as that combination of values $\mathbf{x}_{DET} = [x^p_{SET,1},.., x^p_{SET,M}]$ which corresponds to the vector **v** with the smallest length, wherein $\mathbf{v}_{old}$ is one of the vectors **v** resulting from step 3. The principle of this algorithm can also be illustrated with figure 5. The relevant parameters in the example of figure 5 are M=2, N=1, C=2. After the first ~~Step~~ Step, the 4 vectors v result, the lengths of these ~~vector~~ vectors are given with **(XXIII)**. Also a pre-determined threshold value T_1 ~~46~~46, which is applied in Step 2 is presented in the figure 5. As a result of the threshold T_1 ~~46~~46, the branch $\|r - \mathbf{h}_1 * j\|$ (corresponding to v1 and v3 in **(XXIII)**) is discarded in the subsequent Steps. This means that only the lengths of the vectors v2 and v4 are calculated in Step 3 of the algorithm. Hereafter the threshold T_1 46 is adjusted to the new threshold value T_2 48 for the next Step 4. Next, the Steps 4 and 5 are performed, which includes the selection of the smallest vectors **v**, after which the algorithm jumps to Step 6. Step 6

selects the Maximum Likelihood detection signal between the two ~~left~~ remaining test signals $\mathbf{x}^2_{SET}$ and $\mathbf{x}^4_{SET}$. The Maximum Likelihood solution appears to be $\mathbf{x}_{DET} = \mathbf{x}^4_{SET}$.

Amend paragraph beginning at page 19, line 1 as follows:

The embodiments of the wireless data communication system comprising the Reduced Search Techniques as described hereinbefore can also be applied with a modification for providing a further reduction in processing time. According to this modification, ~~a factor C less~~ a number of test vectors in the test set reduced by a factor of C have to be checked out in equation **(I)**. In ~~said modification~~ this modification, the signal processing-unit is arranged to find, in use, the detection signal $\mathbf{x}_{DET}$ according to a Reduced Search Technique which also comprises the following steps:

Amend the abstract beginning at page 27, line 1 as follows:

~~The invention relates to a~~A wireless radiofrequency data communication system ~~comprising:~~ has a base-station ~~comprising~~ with ~~a multiple of~~ N first groups and a signal processing-unit ~~comprising~~ with a memory ~~means~~ and processor. ~~processing means, wherein , each~~ Each first group ~~comprises~~ has a receiver-unit provided with a receiver and at least one antenna which is connected to the receiver-unit, ~~wherein~~and the signal processing-unit is connected with each of the first groups for processing receive-signals generated by each of the first groups.~~, and.~~ The base station further has ~~a multiple of~~ M second groups for transmitting radiofrequency signals to the first groups. ~~, wherein each~~Each second group ~~comprises~~ has a transmitter-unit provided with a transmitter and at least one antenna which is connected to the transmitter-unit. ~~; wherein t~~The memory ~~means~~ of the signal processing-unit is provided with ~~means comprising~~ information about the transfer-functions of radiofrequency signals from each of the antennas of the second groups to each of the antennas of the first groups, and ~~wherein~~ the transmitters and receivers operate on essentially the same radio frequency or radiofrequency-band.